Q1.

In[16]:=
```
ClearAll;



x0 = Input["Enter initial guess:"];
Nmax = Input["Enter maximum number of iterations:"];
eps = Input["Enter the value of convergence parameter: "];

Print["x0=", x0];
Print["Nmax=", Nmax];
Print["Epsilon=", eps];

f[x_] := Cos[x];
Print["f[x] :=", f[x]];

fp[x_] := Evaluate[D[f[t], t] /. t → x];
Print["f'[x] :=", fp[x0]];

For[i = 1, i ≤ Nmax, i++,

  x1 = N[x0 - f[x0] / fp[x0]];

  Print["In", i, " th Number of iterations the approximation to root is:", x1];
  Print["Estimated error is :", Abs[x1 - x0]];

  If[Abs[x1 - x0] < eps,
    Print["The final approximation of root is:", x1];
    Print["Estimated error is :", Abs[x1 - x0]];
    Return[x1];
  ];

  x0 = x1;(* Update *)
];

Print["The final approximation of root is:", x1];
Print["Estimated error is :", Abs[x1 - x0]];

Plot[f[x], {x, -1, 3}]
```

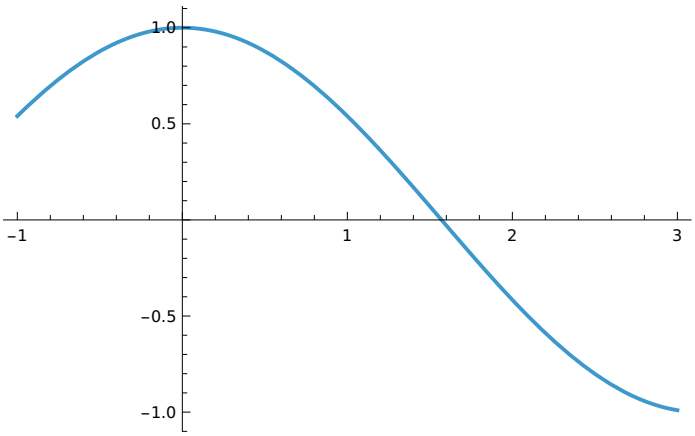
```
x0=1
Nmax=5
Epsilon=0.0001
f[x] :=Cos[x]
f'[x] :=-Sin[1]
In1 th Number of iterations the approximation to root is:1.64209
Estimated error is :0.642093
In2 th Number of iterations the approximation to root is:1.57068
Estimated error is :0.0714173
In3 th Number of iterations the approximation to root is:1.5708
Estimated error is :0.00012105
In4 th Number of iterations the approximation to root is:1.5708
Estimated error is :5.91305×10^-13
The final approximation of root is:1.5708
Estimated error is :5.91305×10^-13
```

Out[27]=

```
1.5708
```

```
The final approximation of root is:1.5708
Estimated error is :5.91305×10^-13
```

Out[30]=



Q2.

In[46]:=
```
ClearAll;


x0 = Input["Enter initial guess:"];
Nmax = Input["Enter maximum number of iterations:"];
eps = Input["Enter the value of convergence parameter: "];

Print["x0=", x0];
Print["Nmax=", Nmax];
Print["Epsilon=", eps];

f[x_] := Cos[x] - x + Exp[x];
Print["f[x] :=", f[x]];

fp[x_] := Evaluate[D[f[t], t] /. t → x];
Print["f'[x] :=", fp[x0]];

For[i = 1, i ≤ Nmax, i++,

  x1 = N[x0 - f[x0] / fp[x0]];

  Print["In", i, " th Number of iterations the approximation to root is:", x1];
  Print["Estimated error is :", Abs[x1 - x0]];

  If[Abs[x1 - x0] < eps,
    Print["The final approximation of root is:", x1];
    Print["Estimated error is :", Abs[x1 - x0]];
    Return[x1];
  ];

  x0 = x1; (* Update *)
];

Print["The final approximation of root is:", x1];
Print["Estimated error is :", Abs[x1 - x0]];

Plot[f[x], {x, -1, 3}]
```

```
x0=1
Nmax=5
Epsilon=0.0001
f[x] :=e^x - x + Cos[x]
f'[x] :=-1 + e - Sin[1]
In1 th Number of iterations the approximation to root is:-1.57591
Estimated error is :2.57591
In2 th Number of iterations the approximation to root is:-10.1715
Estimated error is :8.59555
In3 th Number of iterations the approximation to root is:-4.55108
Estimated error is :5.62038
In4 th Number of iterations the approximation to root is:-2.32436
Estimated error is :2.22672
In5 th Number of iterations the approximation to root is:7.7275
Estimated error is :10.0519
The final approximation of root is:7.7275
Estimated error is :0.
```

Out[60]=